July 11, 2013

Project 4088115718

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Subject **Technical Memorandum Review of USEPA Groundwater Model Files**
North Hollywood Operable Unit
North Hollywood, California

Dear Mr. Dehghi:

On June 13, 2013, AMEC held a conference call with USEPA and its consultant CH2M Hill to address questions regarding the results of NHOU forecast model Scenario F provided to AMEC on May 29, 2013. During the call, it became apparent that USEPA's consultant had again posted incorrect model runs (Scenario F) to the project website that were inconsistent with the proposed 2013 draft NHOU Groundwater Management Plan (GMP; March 7, 2013). On June 14, 2013, updated model file directories for Scenario F (ScenarioF_Verified.zip) were posted to the USEPA project website and subsequently downloaded by AMEC staff.

Files provided by USEPA ScenarioF_Verified directory included:

1) A set of MODFLOW-SURFACT input files for run r712i,
2) A Groundwater Vistas file for model run r712 (r712i_AddNHE-2_CorrectFlows.gwv),
3) A spreadsheet (Recharge_Check.xls) comparing specified and simulated non-spreading recharge, and
4) A spreadsheet (WellText_VerifyScenF.csv) with a well import file for GWV

AMEC staff ran the Scenario F model as provided by USEPA using MODFLOW-SURFACT, a proprietary version of MODFLOW. In addition, AMEC Staff converted the Scenario F model to run using MODFLOW-NWT, a more recent version of USGS MODFLOW in the public domain.

Following is our evaluation of Scenario F.

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WATER BUDGET SPREADSHEET

Previously, USEPA provided a water balance spreadsheet which presents an annualized water budget for the San Fernando Valley based on the water year for the period 2012/13 through 2039/40. These also appear to be consistent with projections contained in the Draft GMP. Various assumptions were made regarding municipal pumping, remediation pumping, artificial recharge, and natural recharge as discussed below.

1) NHOU pumping is assumed to increase from 1937 acre-feet per year (AFY) to 4,923 AFY starting in 2015. NHOU production remains at 4,923 AFY for the remained of the forecast period.
2) LADWP production increases significantly starting in 2019 with the addition of pumping from North Hollywood West at 30,890 AFY, North Hollywood East at 5,620 AFY, and Rinaldi-Toluca at 33,492 AFY. Tujunga production also increases in 2019 from 15,674 to 31,897 AFY.
3) Surface water spreading (recharge) appears to be based on the historic record, with wet and dry years. Recharge rates range between 9,400 and 112,240 AFY and includes assumed constant recharge of 6,200 AFY at Pacoima starting in 2012. Additional groundwater recharge is assumed to occur at Hansen and Pacoima starting in 2024 at 15,000 AFY, increasing to 22,500 AFY in 2029, and 30,000 AFY in 2034.
4) Surface water credits of about 2,000 AFY are assumed to start in 2019 at Hansen, Pacoima, and Tujunga, increasing to 4,000 AFY in 2024, 8,000 AFY in 2029, and 15,000 AFY in 2034.
5) Other recharge (Valley Fill, Return Flows, and Mountain Front Recharge) are variable annually, and appear to represent dry and wet periods. The basis for the recharge values is not presented.
6) Total predicted change in storage (recharge minus withdrawals) is estimated to be 108,000 AF at the end of the 28-year period.

MODEL FILES:

The supplied Groundwater Vistas model file **r712i.gwv** was used to prepare and run the model using MODFLOW-SURFACT version 3.0. The resulting model output heads and water balance summary were used to compare model inputs/output with the proposed water balance spreadsheet for each 1-year long stress period as discussed below.

1) Heads in the NHOU area for the r712i run range between 445 and 450 feet above mean sea level (AMSL) at the end of the simulation period (Figure 1). This is approximately equal to the heads reported in the October 27, 2012 memorandum.
2) The simulated head at a hypothetical observation well in layer 1 near NHE-2 (Figure 2) shows a rise and fall similar to that presented in Figure 2 of the October 27, 2012 memorandum.

3) Forward particle tracks in model layer 1 and 2 for the r712i run are attached as Figure 3 (below). Differences between these particle tracks and Figure 3 included in the October 27, 2012 memorandum are apparent. Many particles released in model migrate to the southeast and are not contained within the NHOU area.

WATER BUDGET SPREADSHEET VERSES MODEL WATER BALANCE:

The proposed water budget spreadsheet and the simulated water balance were compared to attempt to identify differences that may be causing the discrepancies between the model simulation and the October 27, 2012 memorandum. The differences are provided on the accompanying Table 1 which shows these differences corresponding to the entries in the proposed water budget spreadsheet.

1) Comparison of simulated water balance and the water budget spreadsheet shows significant differences between the proposed pumping and the simulated pumping (Table 1, Figure 4). At the end of the simulation period, cumulative proposed withdrawals were 3,217,815 AF while the simulated cumulative pumping was 3,164,142 AF, a discrepancy of 53,673 AF of additional pumping. Most of the lost pumping is from the NHOU extraction well field (-8,650 AF) near the end of the simulation. Additional losses occur at LADWP Mission (-10,339 AF) and Vulcan (-16,515 AF) throughout the simulation.
2) Comparison of simulated water balance and the water budget spreadsheet shows slight differences between the proposed recharge by spreading and simulated recharge by spreading (Table 1, Figure 5). At the end of the simulation period, cumulative proposed spreading was 1,376,784 AF while the simulated spreading (well inflow) was 1,375,979 AF, a discrepancy of -805 AF of recharge.
3) Comparison of simulated water balance and the water budget spreadsheet shows slight differences between the proposed recharge by others (valley fill, return flows, and mountain front recharge) and simulated recharge by others (Table 1, Figure 6). At the end of the simulation period, cumulative proposed recharge by others was 1,949,048 AF while the simulated recharge by others (areal RCH) was 1,947,902 AF, a discrepancy of -1,950 AF of recharge.

Comparison of simulated water balance and the water budget spreadsheet shows a significant difference between the proposed net change in storage (recharge – withdrawals) and simulated net change in storage (Table 1, Figures 7 and 8). At the end of the simulation period, cumulative net change in storage was -108,016 AF (indicating a gain in storage) while the simulated net change in storage was 159,739 AF (indicating an increase in storage), a discrepancy of 51,723 AF. Most of this can be attributed to the 53,673 AF of lost pumping in the simulation.

CONCLUSIONS

1) The model file provided appear to encode the projections included in the Draft GMP and summarized in the October 27, 2012 memorandum.

2) The USEPA's Draft Groundwater Management Plan (GMP; March 7, 2013) states that "LADWP and USEPA project that LADWP can pump from the following wellfields at the following annual maximum quantities without unreasonably interfering with the effectiveness of the NHOU2IR". While this statement is accurate for the beginning of the simulation period, the **r712i** simulation results show that the LADWP projections are not sustainable during the later part of the simulation (i.e., >22 years) when significant pumping losses may occur at the NHOU extraction well field (Figure 9). Examples of this include the complete loss of pumping from NEW-1 and NEW-2, and partial loss of pumping in NHE-3, -4, and -5. Loss of pumping also occurs at Vulcan and LADWP Mission wells. Also, we note that extraction well NEW-3, as proposed in the FFS, is not simulated in the r712i simulation, although it is unclear whether its omission is related to the projected NHOU pumping losses.

3) The simulation appears to represent pumping of the NH East well field starting in 2019 from NH-2 and NH-30 only. Wells NH-02 and NH-30 are reportedly "inactive" and "sealed", respectively. The simulated pumping rate is about 1,740 gpm each, rather than as split among several wells at 500 gpm each as had been discussed previously. The concentration of flow at only two wells may have a more pronounced effect on contaminant migration than a more distributed yield.

4) The GWV file appears to incorporate many changes to well screen intervals from the FFS model in response to MWH discovery that many such screened intervals were inconsistent with the data in the USEPA well construction database. However, some discrepancies still exist, although they may not be too influential on the model predictions.

5) Particle tracking indicate that some particles released in model migrate to the southeast and are not contained within the NHOU area. Some of the particles maybe captured by LADWP wells or even migrate into the Glendale area.

6) Particle tracking also indicates that vertical migration of some particles in to deeper layers may occur through cross communication via wells (the MODFLOW-SURFACT FLW4 package with MODPATH3 will allow particle movement vertically between model layers).

ADDITIONAL NEEDED INFORMATION

1) What was the basis of the initial head distribution used in the model? As discussed during the June 14 call, CH2M Hill was to further determine the method for producing the initial head distribution.

2) What was the basis/rationale for the frequency, amounts, and pattern (if there is one) of recharge (or available water to return to the aquifer) for the various wet and dry years. This appears to be on 11-year cycles as suggested in the Draft GMP, but it is not known exactly what portion of the record was used and if this is average or conservative.

3) Further discussion with CH2M Hill and USEPA is needed to resolve discrepancies AMEC has discovered through examination of the Scenario F model files.

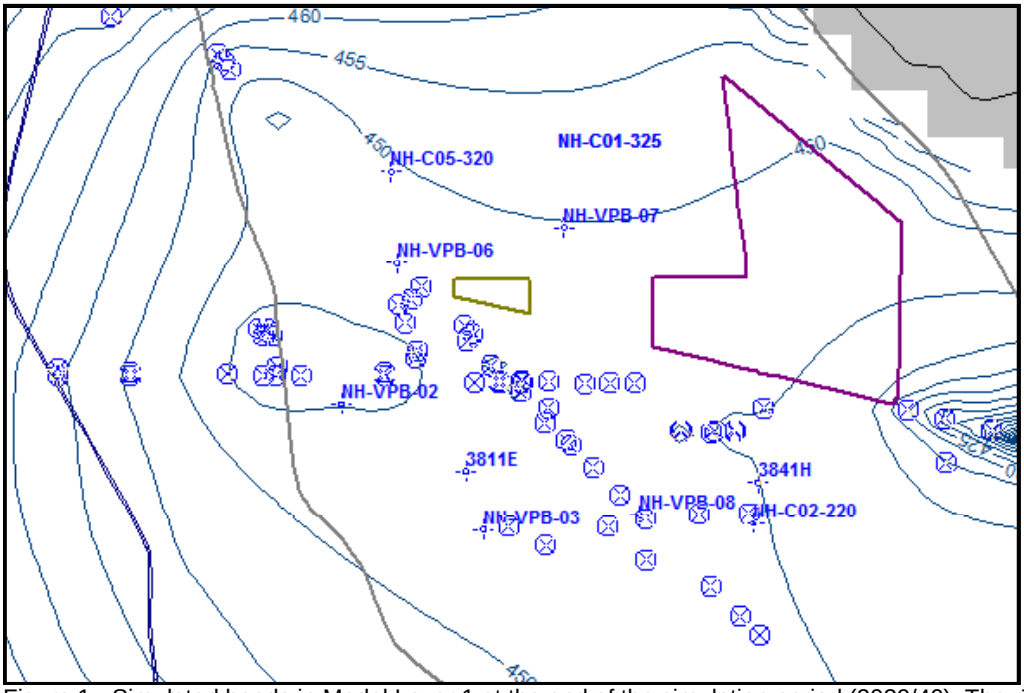

Figure 1 - Simulated heads in Model Layer 1 at the end of the simulation period (2039/40). The r712i heads are approximately equal to those presented in Figure 1 of the October 27, 2012 memo.

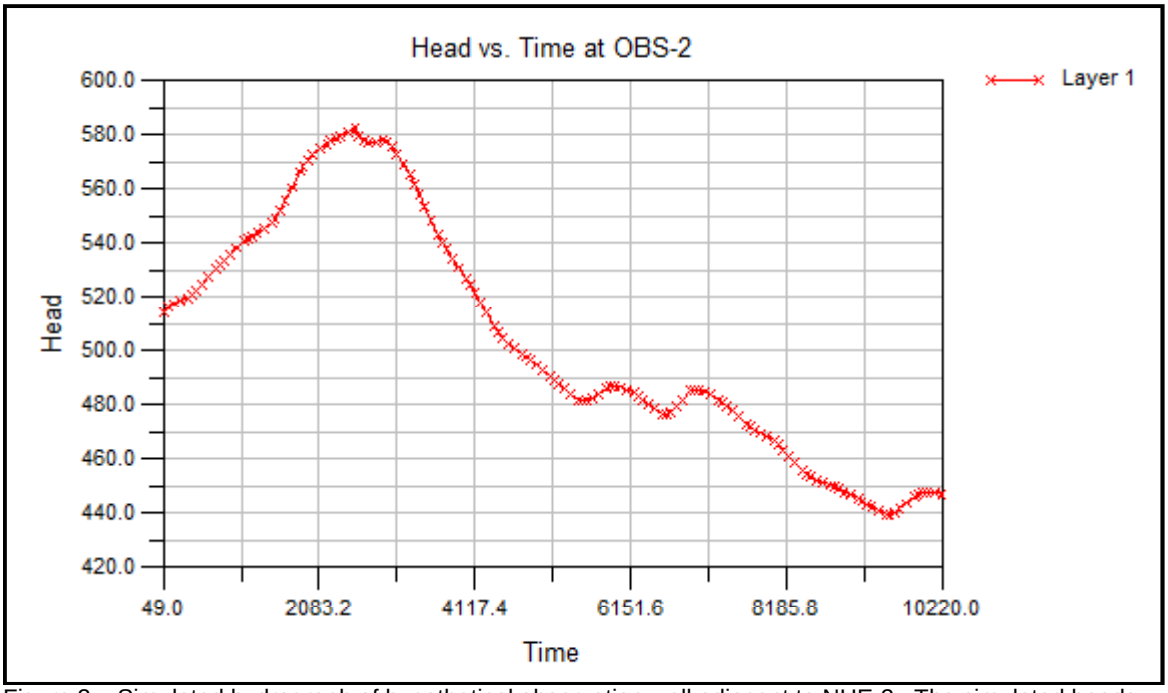

Figure 2 – Simulated hydrograph of hypothetical observation well adjacent to NHE-2. The simulated heads are approximately equal to those presented on Figure 2 of the October 27, 2012 memo.

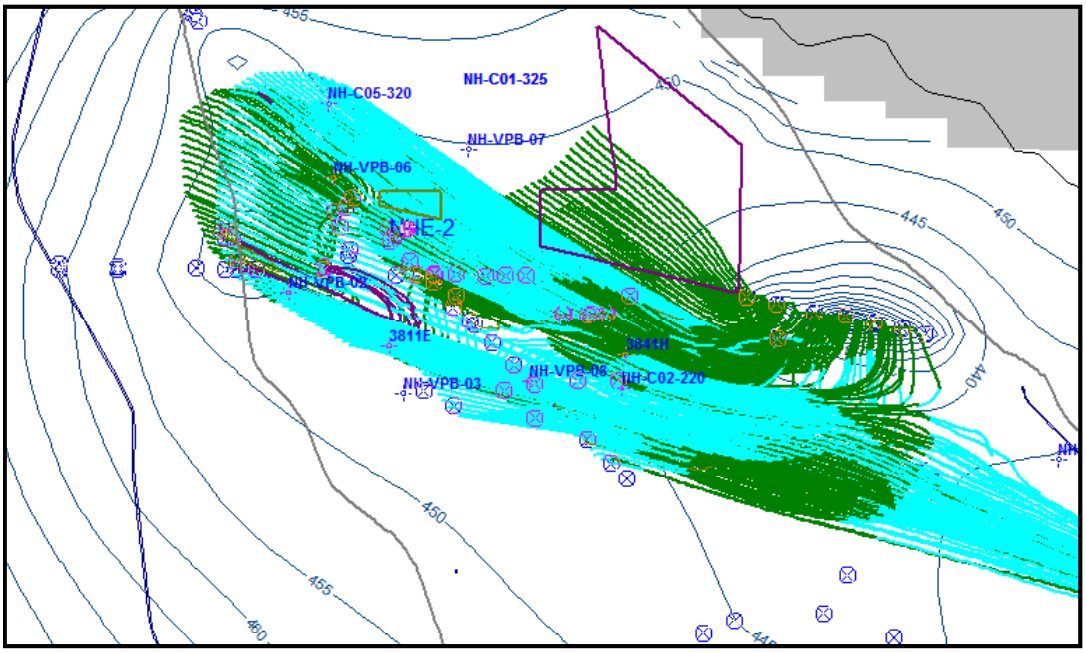

Figure 3 – Simulate forward particle tracks in model Layer 1 shows that many particles are migrating out of the NHOU containment area to the southeast. Some particles also appear to move down vertically into model layer 3 and 4. Note the dissimilarity with Figure 3 of the October 27, 2012 memo.

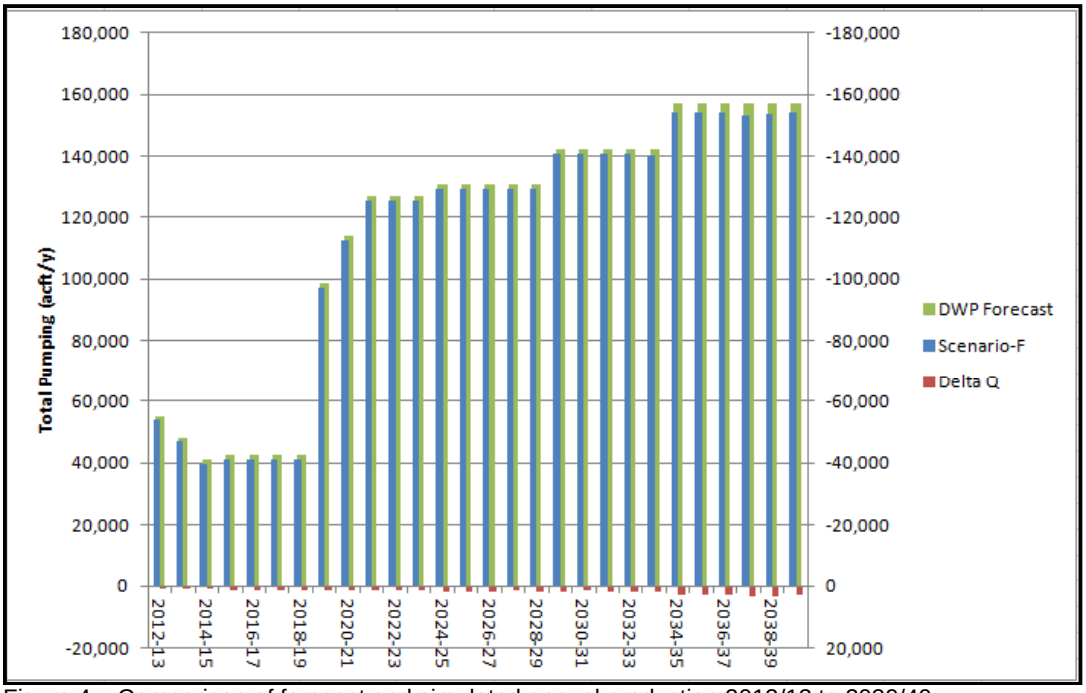

Figure 4 – Comparison of forecast and simulated annual production 2012/13 to 2039/40

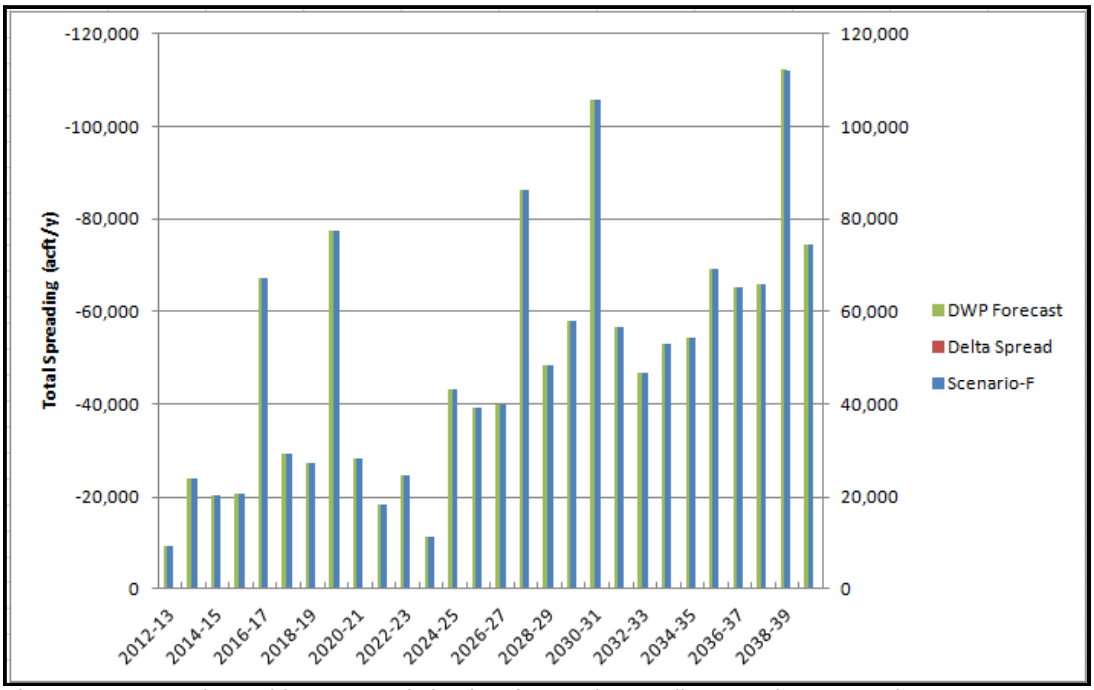

Figure 5 – Comparison of forecast and simulated annual spreading 2012/13 to 2039/40

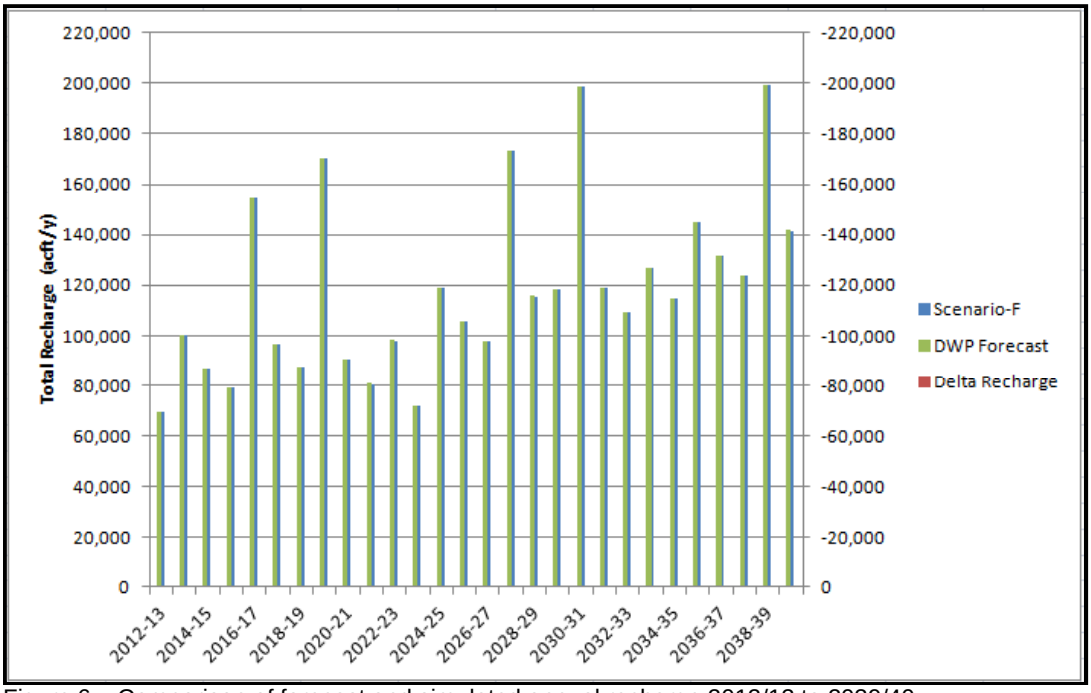

Figure 6 – Comparison of forecast and simulated annual recharge 2012/13 to 2039/40

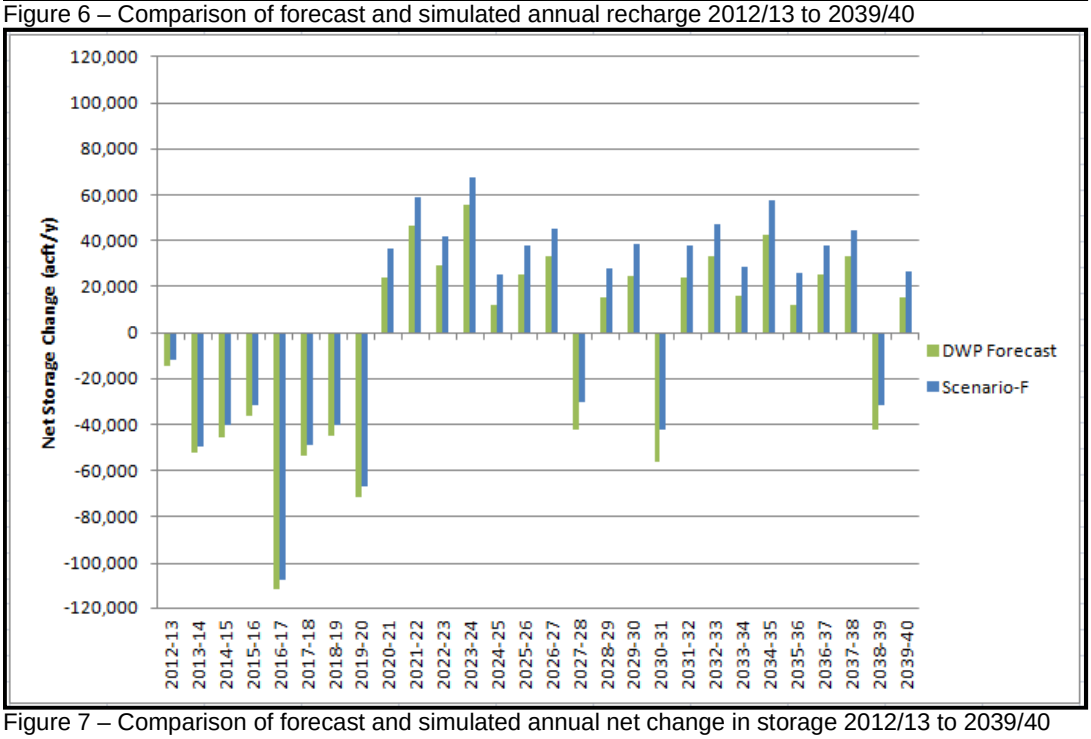

Figure 7 – Comparison of forecast and simulated annual net change in storage 2012/13 to 2039/40

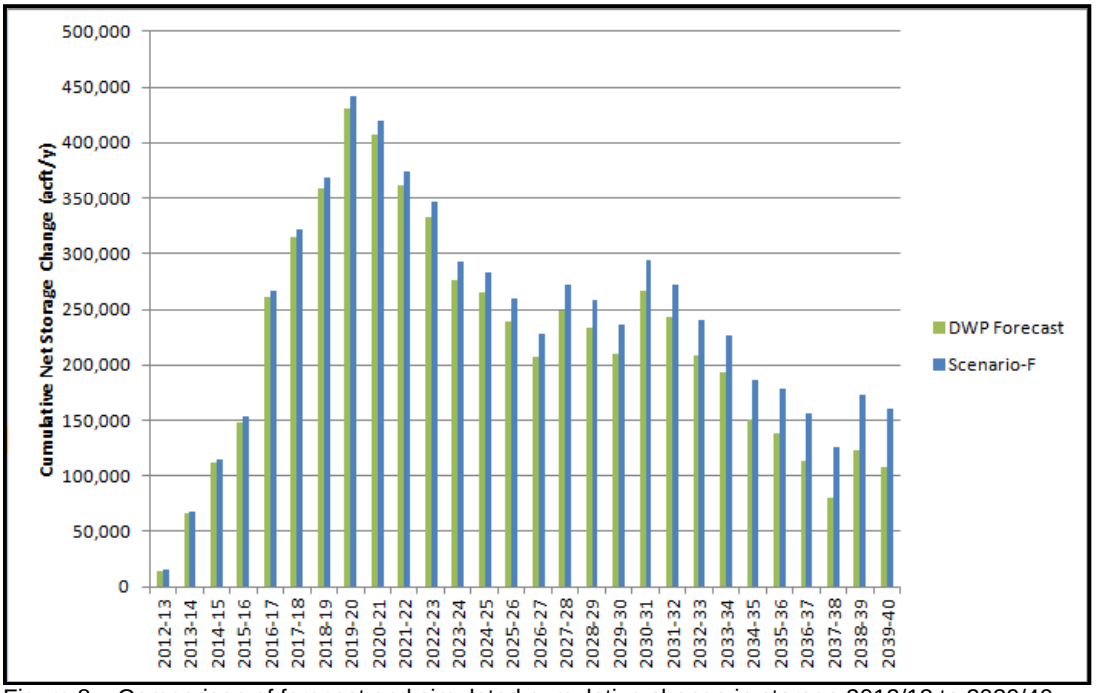

Figure 8 – Comparison of forecast and simulated cumulative change in storage 2012/13 to 2039/40

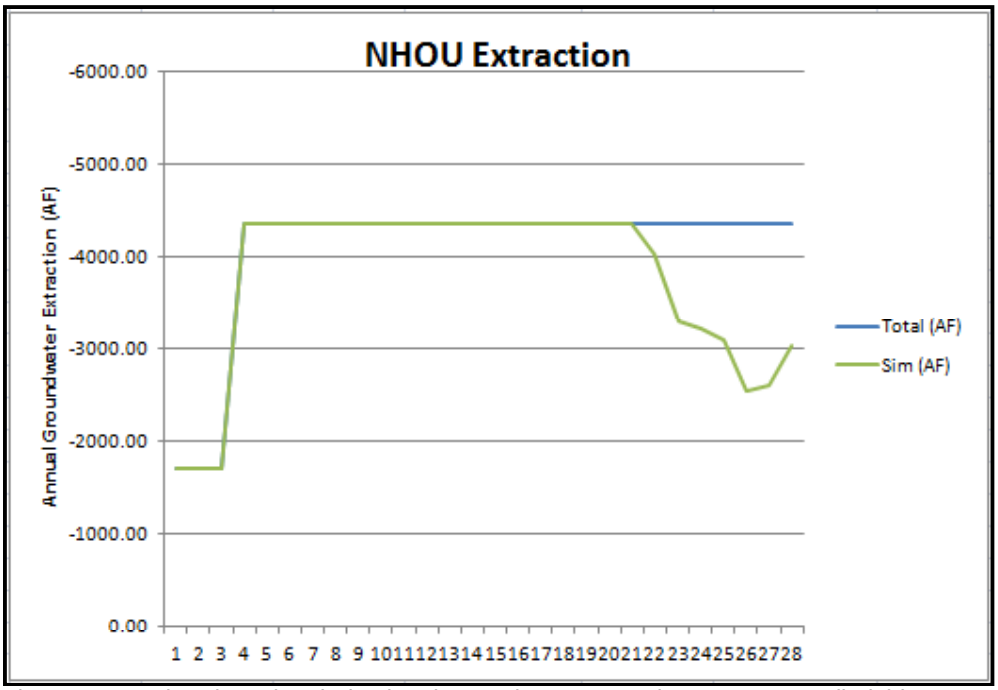

Figure 9 – Total Projected and Simulated groundwater extraction at NHOU Well Field

Sincerely yours,
AMEC Environment & Infrastructure, Inc.

w/permission

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Project Manager

David Bean
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Attachments: Water Budget Forecast

Model Pumping Scenario	Well Field or Recharge Basin	Water Year (July 1 through June 30) 2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31	2031-32	2032-33	2033-34	2034-35	2035-36	2036-37	2037-38	2038-39	2039-40	2014-2019 Avg Net Annual Withdrawal	2019-2024 Avg Net Annual Withdrawal	2024-2029 Avg Net Annual Withdrawal	2029-2034 Avg Net Annual Withdrawal	2034-2039 Avg Net Annual Withdrawal	**2012-2040 Avg Net Annual Withdrawal**
	Scenario-F Wells Out	-54,069	-46,864	-39,828	-41,211	-41,292	-41,256	-41,224	-97,295	-112,445	-125,412	-125,433	-125,300	-129,246	-129,226	-129,193	-129,278	-129,242	-140,703	-140,801	-140,734	-140,711	-140,406	-154,133	-154,099	-153,948	-153,371	-153,513	-153,909	-3,164,142	-60	-72	-79	-84	**-70**
	Delta Pumping	911	1,116	1,150	1,544	1,464	1,499	1,531	1,462	1,536	1,568	1,547	1,680	1,734	1,754	1,787	1,702	1,738	1,777	1,679	1,746	1,769	2,074	2,847	2,881	3,032	3,609	3,467	3,071	53,673					
	Total All Wells:	***54,980***	***47,980***	***40,978***	***42,755***	***42,755***	***42,755***	***42,755***	***98,757***	***113,980***	***126,980***	***126,980***	***126,980***	***130,980***	***130,980***	***130,980***	***130,980***	***130,980***	***142,480***	***142,480***	***142,480***	***142,480***	***142,480***	***156,980***	***156,980***	***156,980***	***156,980***	***156,980***	***156,980***	-58549	16504	8586	8112	13995	**-3858**
	Total LADWP Wells:	***35,000***	***28,000***	***20,998***	***22,775***	***22,775***	***22,775***	***22,775***	***78,777***	***94,000***	***107,000***	***107,000***	***107,000***	***111,000***	***111,000***	***111,000***	***111,000***	***111,000***	***122,500***	***122,500***	***122,500***	***122,500***	***122,500***	***137,000***	***137,000***	***137,000***	***137,000***	***137,000***	***137,000***	3,217,815					
	NHOU Extraction:	1,937	1,937	1,937	4,923	4,923	4,923	4,923	4,923	4,923	4,923	4,923	4,923	4,923	4,923	4,923	4,923	4,923	4,923	4,923	4,923	4,923	4,923	4,923	4,923	4,923	4,923	4,923	4,923						
	North Hollywood West:	2,967	1,567	1,211	0	0	0	0	16,890	15,890	30,890	30,890	30,890	30,890	30,890	30,890	30,890	30,890	30,890	30,890	30,890	30,890	30,890	30,890	30,890	30,890	30,890	30,890	30,890						
	North Hollywood East:	0	0	0	0	0	0	0	5,620	5,620	5,620	5,620	5,620	5,620	5,620	5,620	5,620	5,620	5,620	5,620	5,620	5,620	5,620	5,620	5,620	5,620	5,620	5,620	5,620						
	Rinaldi-Toluca:	4,451	2,350	0	0	0	0	0	33,492	33,492	32,492	32,492	32,492	34,492	34,492	34,492	34,492	34,492	40,242	40,242	40,242	40,242	40,242	47,492	47,492	47,492	47,492	47,492	47,492						
	Tujunga:	15,674	15,674	15,674	15,674	15,674	15,674	15,674	15,674	31,897	30,897	30,897	30,897	32,897	32,897	32,897	32,897	32,897	38,647	38,647	38,647	38,647	38,647	45,897	45,897	45,897	45,897	45,897	45,897						
	Erwin:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
	Whitnall:	5,106	1,741	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
	Verdugo:	2,687	2,553	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
	Pollock:	2,178	2,178	2,176	2,178	2,178	2,178	2,178	2,178	2,178	2,178	2,178	2,178	2,178	2,178	2,178	2,178	2,178	2,178	2,178	2,178	2,178	2,178	2,178	2,178	2,178	2,178	2,178	2,178						
	BOU Extraction:	10,162	10,162	10,162	10,162	10,162	10,162	10,162	10,162	10,162	10,162	10,162	10,162	10,162	10,162	10,162	10,162	10,162	10,162	10,162	10,162	10,162	10,162	10,162	10,162	10,162	10,162	10,162	10,162						
	Total Other SFV Wells:	9,818	9,818	9,818	9,818	9,818	9,818	9,818	9,818	9,818	9,818	9,818	9,818	9,818	9,818	9,818	9,818	9,818	9,818	9,818	9,818	9,818	9,818	9,818	9,818	9,818	9,818	9,818	9,818						
	Scenario-F Wells In	9,403	24,125	20,294	20,850	67,203	29,305	27,423	77,263	28,165	18,254	24,516	11,402	43,114	39,283	39,839	86,192	48,294	57,905	105,746	56,648	46,738	52,999	54,376	69,099	65,268	65,824	112,176	74,279	1,375,979					
	Delta Spreading	-5	-14	-12	-12	-39	-17	-16	-45	-16	-11	-14	-7	-25	-23	-23	-50	-28	-34	-62	-33	-27	-31	-32	-40	-38	-38	-66	-43	-805					
	Total Spreading Basins:	***-9,408***	***-24,139***	***-20,306***	***-20,862***	***-67,242***	***-29,322***	***-27,439***	***-77,308***	***-28,181***	***-18,265***	***-24,530***	***-11,408***	***-43,139***	***-39,306***	***-39,862***	***-86,242***	***-48,322***	***-57,939***	***-105,808***	***-56,681***	***-46,765***	***-53,030***	***-54,408***	***-69,139***	***-65,306***	***-65,862***	***-112,242***	***-74,322***						
	Branford (historic):	-460	-562	-468	-547	-641	-415	-345	-585	-462	-444	-932	-460	-562	-468	-547	-641	-415	-345	-585	-462	-444	-932	-460	-562	-468	-547	-641	-415	-1,376,784					
	Hansen (historic):	-1,342	-11,694	-7,487	-8,949	-28,129	-9,809	-8,232	-35,137	-12,052	-6,424	-9,427	-1,342	-11,694	-7,487	-8,949	-28,129	-9,809	-8,232	-35,137	-12,052	-6,424	-9,427	-1,342	-11,694	-7,487	-8,949	-28,129	-9,809						
	Lopez (historic):	-544	-172	-578	-536	-378	-724	-363	-1,086	-182	-144	-518	-544	-172	-578	-536	-378	-724	-363	-1,086	-182	-144	-518	-544	-172	-578	-536	-378	-724						
	Pacoima (historic):	-761	-3,826	-2,909	-696	-20,714	-5,768	-4,532	-14,064	-3,156	-1,731	-3,539	-761	-3,826	-2,909	-696	-20,714	-5,768	-4,532	-14,064	-3,156	-1,731	-3,539	-761	-3,826	-2,909	-696	-20,714	-5,768						
	Tujunga (historic):	-101	-1,685	-2,664	-3,934	-11,180	-6,406	-7,767	-18,236	-4,129	-1,322	-1,914	-101	-1,685	-2,664	-3,934	-11,180	-6,406	-7,767	-18,236	-4,129	-1,322	-1,914	-101	-1,685	-2,664	-3,934	-11,180	-6,406						
	Projected Burbank Recharge at Pacoima:	-6,200	-6,200	-6,200	-6,200	-6,200	-6,200	-6,200	-6,200	-6,200	-6,200	-6,200	-6,200	-6,200	-6,200	-6,200	-6,200	-6,200	-6,200	-6,200	-6,200	-6,200	-6,200	-6,200	-6,200	-6,200	-6,200	-6,200	-6,200						
	Surface Water Credit (SWC)	0	0	0	0	0	0	0	-2,000	-2,000	-2,000	-2,000	-2,000	-4,000	-4,000	-4,000	-4,000	-4,000	-8,000	-8,000	-8,000	-8,000	-8,000	-15,000	-15,000	-15,000	-15,000	-15,000	-15,000						
"2012_F"	Groundwater Recycling (GWR)	0	0	0	0	0	0	0	0	0	0	0	0	-15,000	-15,000	-15,000	-15,000	-15,000	-22,500	-22,500	-22,500	-22,500	-22,500	-30,000	-30,000	-30,000	-30,000	-30,000	-30,000						
	Hansen (new-SWC):	0	0	0	0	0	0	0	-740	-740	-740	-740	-740	-1,480	-1,480	-1,480	-1,480	-1,480	-2,960	-2,960	-2,960	-2,960	-2,960	-5,550	-5,550	-5,550	-5,550	-5,550	-5,550						
	Pacoima (new-SWC):	0	0	0	0	0	0	0	-360	-360	-360	-360	-360	-720	-720	-720	-720	-720	-1,440	-1,440	-1,440	-1,440	-1,440	-2,700	-2,700	-2,700	-2,700	-2,700	-2,700						
	Tujunga (new-SWC):	0	0	0	0	0	0	0	-900	-900	-900	-900	-900	-1,800	-1,800	-1,800	-1,800	-1,800	-3,600	-3,600	-3,600	-3,600	-3,600	-6,750	-6,750	-6,750	-6,750	-6,750	-6,750						
	Hansen (new-GWR):	0	0	0	0	0	0	0	0	0	0	0	0	-7,500	-7,500	-7,500	-7,500	-7,500	-11,250	-11,250	-11,250	-11,250	-11,250	-15,000	-15,000	-15,000	-15,000	-15,000	-15,000						
	Pacoima (new-GWR):	0	0	0	0	0	0	0	0	0	0	0	0	-7,500	-7,500	-7,500	-7,500	-7,500	-11,250	-11,250	-11,250	-11,250	-11,250	-15,000	-15,000	-15,000	-15,000	-15,000	-15,000						
	Scenario-F RCH	60,136	75,810	66,368	58,118	87,330	67,265	60,291	93,076	62,219	62,304	73,522	60,136	75,810	66,368	58,118	87,330	67,265	60,291	93,076	62,219	62,304	73,522	60,136	75,810	66,368	58,118	87,330	67,265	1,947,902					
	Delta RCH	-35	-45	-39	-34	-51	-39	-35	-55	-36	-37	-44	-35	-45	-39	-34	-51	-39	-35	-55	-36	-37	-44	-35	-45	-39	-34	-51	-39	-1,146					
	Total Other Recharge:	***-60,171***	***-75,855***	***-66,407***	***-58,152***	***-87,381***	***-67,304***	***-60,326***	***-93,131***	***-62,255***	***-62,341***	***-73,566***	***-60,171***	***-75,855***	***-66,407***	***-58,152***	***-87,381***	***-67,304***	***-60,326***	***-93,131***	***-62,255***	***-62,341***	***-73,566***	***-60,171***	***-75,855***	***-66,407***	***-58,152***	***-87,381***	***-67,304***	-1,949,048					
	Recharge in Valley Fill:	-4,133	-13,561	-10,309	-6,815	-25,732	-10,539	-8,357	-22,717	-7,079	-6,600	-13,484	-4,133	-13,561	-10,309	-6,815	-25,732	-10,539	-8,357	-22,717	-7,079	-6,600	-13,484	-4,133	-13,561	-10,309	-6,815	-25,732	-10,539						
	Delivered Water Return:	-54,825	-58,007	-52,904	-49,368	-55,072	-53,750	-49,233	-64,709	-52,974	-53,521	-56,256	-54,825	-58,007	-52,904	-49,368	-55,072	-53,750	-49,233	-64,709	-52,974	-53,521	-56,256	-54,825	-58,007	-52,904	-49,368	-55,072	-53,750						
	Mountain Front Recharge:	-1,213	-4,287	-3,194	-1,969	-6,577	-3,015	-2,736	-5,705	-2,202	-2,220	-3,826	-1,213	-4,287	-3,194	-1,969	-6,577	-3,015	-2,736	-5,705	-2,202	-2,220	-3,826	-1,213	-4,287	-3,194	-1,969	-6,577	-3,015						
	Scenario-F Total RCH	69,539	99,935	86,662	78,967	154,532	96,569	87,714	170,339	90,383	80,559	98,038	71,537	118,924	105,651	97,956	173,521	115,558	118,196	198,822	118,866	109,042	126,521	114,512	144,909	131,636	123,941	199,506	141,543						
	Delta Total RCH	-41	-59	-51	-47	-91	-57	-51	-100	-53	-47	-58	-42	-70	-62	-58	-102	-68	-69	-117	-70	-64	-75	-67	-85	-77	-73	-117	-83	-1,950					
	Total Recharge:	***-69,579***	***-99,994***	***-86,713***	***-79,014***	***-154,623***	***-96,626***	***-87,765***	***-170,439***	***-90,436***	***-80,606***	***-98,096***	***-71,579***	***-118,994***	***-105,713***	***-98,014***	***-173,623***	***-115,626***	***-118,265***	***-198,939***	***-118,936***	***-109,106***	***-126,596***	***-114,579***	***-144,994***	***-131,713***	***-124,014***	***-199,623***	***-141,626***						
	Net Withdrawal (negative if recharge exceeds pumping):	**-14,599**	**-52,014**	**-45,735**	**-36,259**	**-111,868**	**-53,871**	**-45,010**	**-71,682**	**23,544**	**46,374**	**28,884**	**55,401**	**11,986**	**25,267**	**32,966**	**-42,643**	**15,354**	**24,215**	**-56,459**	**23,544**	**33,374**	**15,884**	**42,401**	**11,986**	**25,267**	**32,966**	**-42,643**	**15,354**	**-108,016**					
	Scenario-F Net Withdrawal (Positive if RCH exceeds Pumping)	**15,470**	**53,071**	**46,835**	**37,756**	**113,241**	**55,313**	**46,490**	**73,044**	**-22,061**	**-44,853**	**-27,395**	**-53,763**	**-10,323**	**-23,575**	**-31,237**	**44,243**	**-13,684**	**-22,507**	**58,021**	**-21,868**	**-31,669**	**-13,885**	**-39,621**	**-9,191**	**-22,312**	**-29,430**	**45,993**	**-12,366**	**159,739**						
	Phase of New Pumping/Recharge Implementation:					New NHOU Extraction Well Pumping Rates			Implement Centeralized LADWP VOC Treatment, New LADWP Recharge from Advanced Water Treatment Process and improve storm water capture projects, Continue New NHOU Pumping and Increased LADWP Pumping Rates																										
	Cumulate Net Change	14,599	66,613	112,348	148,607	260,475	314,346	359,356	431,038	407,494	361,120	332,236	276,835	264,849	239,582	206,616	249,259	233,905	209,690	266,149	242,605	209,231	193,347	150,946	138,960	113,693	80,727	123,370	108,016						
		15,470	68,540	115,375	153,131	266,372	321,686	368,175	441,220	419,158	374,306	346,910	293,147	282,824	259,249	228,013	272,256	258,572	236,065	294,086	272,219	240,550	226,665	187,044	177,853	155,542	126,112	172,105	159,739						
		15,470																																	

Note:

- LADW Anticipated Maximum Pumping Scenario from San Fernando Basin Based on the Urban Management water Plan (UMWP) of 2010.
- Cells highlited with pink color are added or revise.
- Burbank projected in the Groundwater Pumping and Spreading Plan (July 2011) to spread 6,200 AF of imported water at Pacoima Spreading Grounds.